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# Data Analysis and Probability Problems

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**Objectives:** Modeling with TI is easy learning and attractive; Models created by TI have graphical pictures and they are memorable and understandable; In TI parameters are changeable so models can be used as dynamic models; With TI students can work with entire of classroom and do brainstorming easily. In general, TI is easy to use and it is not that much complicated to learn. Also, it's fun; so, it energizes students to explore verity subjects in math and science. Smart student don't get bored with TI because they can work on verity problems in different way. It helps student to create graphical models and doing self-directed activities and share it with others. Mathematical calculation using TI is easy. Students are able to understand relations better. They can solve problem in different way and validate it and visualize it for verity of solutions. In science, not only they are able to see related mathematical models but also they can use TI as a database for scientific information. TI modeling is dynamic modeling because students are able to change variable and inputs.

Mathematical Concept or “key idea” that TI Technologies will be used to teach

TI is good for data Analysis and Probability problems; following solutions step-by-step is easy by using TI. Students can input their gathered data in lists or matrix. They can interpret data from scatter plots with finding regression lines. They can patterns and visualize the differences between their guess and actual absolute values. They can compare data with different units and make Z-score. They can make correlation Coefficient of determinations. They can make histograms and box plots. They can calculate statistical values as mean, median, mode, range, variance and standard deviation. By adding or multiplying constants to their data or entering more data they can visualize change of shape& center. They can compare transformed data using box plots.

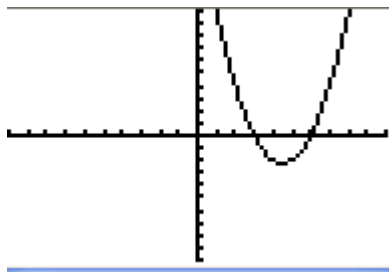
Also they can find and visualize ranges, outliers, gaps, and trends.

Also TI is perfect for calculating Algebraic expressions as equations, differentials, and other math functionalities. Graphing elusions visualizes the concepts of algebraic equations for students.

## **Planed Lesson: Quadratic Equations**

For assessing prior knowledge of student, I like testing them with a visual/verbal assessment

And TI technology will be a good choice to make a visual model of an equation and asking student about that model. So I start my class by showing students a graph of  $x^2 - 9x + 18 = 0$  instead of giving them mathematical expression



That I made it before for today's presentation. Then on base of this graph, I asked students to guess the equation of this graph. Students can guess individually or in a group of three/four and they share their answers and compete. I give a prize for best guess. Answer will be  $x^2 - 9x + 18 = 0$  Then I ask everyone find the factor of this equation and volunteer answering have to explain why? The above graph helps them to find the answers, which are 3 and 6

because the graph has intersection with  $Y=0$  in  $X=3$  and  $X=6$ . After that we evaluate the answers By inputting them in equation and check for equality expression by zero. Now we solve this equation by using formula:  $(-b \pm \sqrt{b^2 - 4ac})/2a$ ; I suppose, our class has TI navigator and all student have TI. Every 5 minutes we do parallel transactions with TI doing same concept. Thus, not only I can teach about the mathematical concept of today lesson; but also, showing students to do it with their TI. It is very nice that every one can show their TI work to each other; and also, I can assess they're understanding step by step. During my lessons I can be sure all students are following and they are in same page. Also, at the end of today's lesson, I ask all students to do same procedure for other equation (as  $x^2 - 9x + 18 = 0$ ) and asking them to describe their solutions using TI for a group of peers or classroom and I assess them on base of their representations and answering meaningfully my questions about why they answers are valid. As you see, TI can make a major rule in understanding the concept of solving quadratic formula.

Following is the step that we done with TI during our today's class:

First we use TI solver to find roots for this equation; but before that we have to select **Frac.** From **Math**

And clearing the existed equation if there was an existed equation and not see **eqn:0=** for doing that using the up arrow and press **clear**

## EQUATION SOLVER

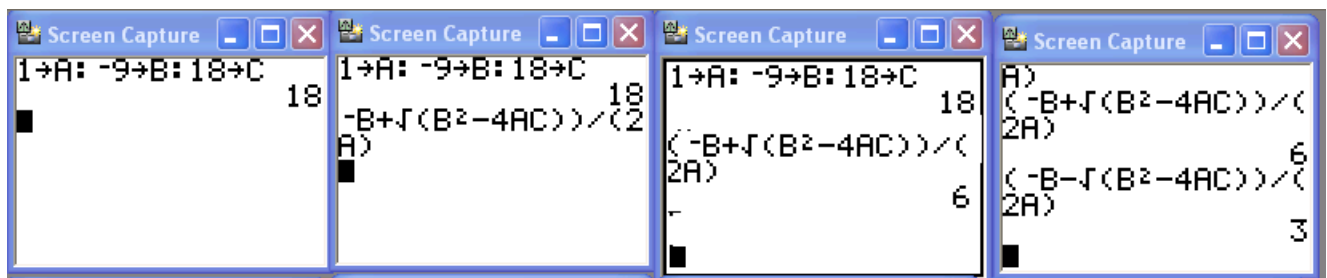
eqn:  $0 =$

We solve equation  $x^2 - 9x + 18 = 0$  by using math option and solve key then we can input above formula to solve this problem; also, we can draw graph and do tracing to evaluate our answers.

Press	Result
Math	<div> <div>NUM CPX PRB</div> <div>1: ▸Frac</div> <div>2: ▸Dec</div> <div>3: 3</div> <div>4: √(</div> <div>5: *√</div> <div>6: fMin(</div> <div>7: ↓fMax(</div> </div>
Enter	EQUATION SOLVER eqn: 0=
<div> <div>X,T,q, n</div> <div><math>x^2</math></div> <div>-</div> <div>9</div> <div>X,T,q, n</div> </div> <div> <div>+</div> <div>18</div> </div>	EQUATION SOLVER eqn: 0= $x^2-9x+18$
Enter	$x^2-9x+18=0$ $x=0$ bound={ -1E99, 1...
Alpha [Solve]	$x^2-9x+18=0$ ▪ $x=3$ bound={ -1E99, 1... ▪ left-rt=0
100	$x^2-9x+18=0$ $x=100$ bound={ -1E99, 1... left-rt=0
Press	Result
Alpha [Solve]	$x^2-9x+18=0$ ▪ $x=6$ bound={ -1E99, 1... ▪ left-rt=0



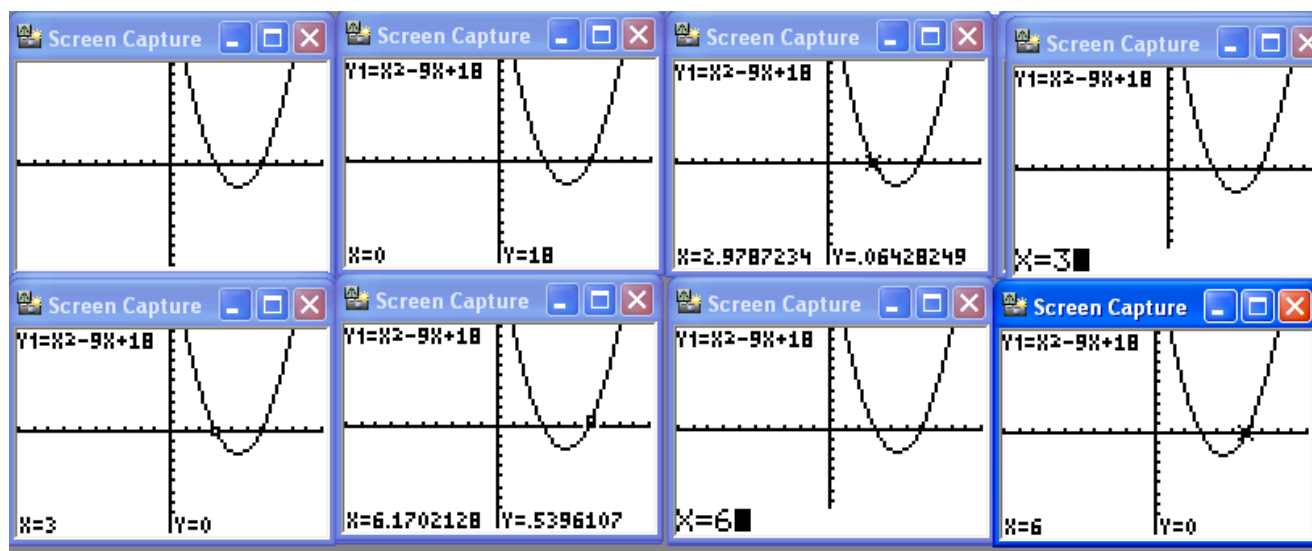
Now we solve the same equation by using quadratic formula: for entering equation we use **STO→** Key to store a value to a parameters and we do following transaction to entering the calculation:



As you see in above we stored the coefficients (A, B, C) in  $\frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$

We used **[:]** to enter a new instruction on the same line and pressing **Enter** to entering each statement in TI Also after calculating the first answer we have change a **[+]** to a **[-]** to find the second answer; thus we press **[2nd]** **[ENTER]** to recall the fraction conversion entry, and again press **[2nd]** **[ENTER]** to recall the quadratic formula expression. And press up arrow to move the cursor onto the **+** sign in formula and press **-** to edit the quadratic formula expression to become  $(-B - \sqrt{B^2 - 4AC})/2A$  and press **ENTER** to find the other solution.

After this step we Displaying and tracing the graph by press **GRAPH** to graph the selected function in the viewing window. Right arrow key activities the free moving graph cursor The X,Y coordinates values for the position of the graph cursor are displayed on bottom line and arrow keys use to move the free moving cursor to find the intersections with  $Y=0$



Press **[CALC]** and select value then enter 0 for the value of x we see y is 18 it means this graph has interaction with axis Y in  $Y=18$ ; also if we enter 3 instead of 0 we see  $Y=0$  it means the answer 3 is correct because this graph has interaction with axis x in  $X=3$  also for 6 occurs same. Thus we can validate our solution by going to

graph mode and calculate the value of Y with answers for X.

Thus TI not only helps us to solve the equation; but also, we can visualize the answer validation.



